

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

To:

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## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/JP2005/012161

International filing date (day/month/year)  
24.06.2005

Priority date (day/month/year)  
28.06.2004

International Patent Classification (IPC) or both national classification and IPC:  
G03F7/039, B41J2/16

Applicant  
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1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1b/s(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**Box No. I Basis of the opinion**

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1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
  
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:  
  
☐ a sequence listing  
  
☐ table(s) related to the sequence listing
  - b. format of material:  
  
☐ in written format  
  
☐ in computer readable form
  - c. time of filing/furnishing:  
  
☐ contained in the international application as filed.  
  
☐ filed together with the international application in computer readable form.  
  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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**Box No. V Reasoned statement under Rule 43b/s.1(a)(I) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	8-20
	No: Claims	1-7
Inventive step (IS)	Yes: Claims	8-20
	No: Claims	1-7
Industrial applicability (IA)	Yes: Claims	1-20
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

Reference is made to the following documents:

D1: EP 1 251 399 A

D2: EP 0 819 986 A

D3: EP 1 380 423 A

(1) The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-7 is not new in the sense of Article 33(2) PCT.

(1a) Claims 1-7:

The document D1 discloses a positive type photosensitive resin composition comprising a branched binder polymer and a photoacid generator (see page 8, paragraph 47). Said branched binder polymer may be prepared by polymerising methacrylic **anhydride**, methacrylic acid, methyl methacrylate, and n-butyl methacrylate (see page 12, Table 2, branched polymers A and B). Suitable photoacid generators include halogenated triazines, and onium salts (see page 8, paragraph 48).

(1b) Claims 1,3,7:

The document D2 discloses a positive type photosensitive resin composition (see page 9, lines 13-24), comprising (1) an acrylic resin having a carboxylic anhydride structure in the molecule (i.e. poly(methacryloyl t-butyl-carboxylic acid **anhydride** of preparation example 2 on page 5); and (2) a compound that generates an acid when irradiated with light (i.e. 2,4,6-(trichloromethyl)-s-triazine).

(2) The combinations of the features of claims 8-19 are neither known from, nor rendered obvious by, the available prior art. The reasons are as follows:

(2a) Claims 8-12:

The document EP 1 380 423 A (D3) is regarded as being the closest prior art to the

subject-matter of claim 8, and discloses a method of forming a pattern on a substrate by means of a positive type photosensitive resin (see claims 24, 41, 42, and 44), which method comprises;

(1) a step of forming a layer of a positive type photosensitive resin composition comprising an acrylic resin having a carboxylic anhydride structure on the substrate (see claim 44); and

(2) a photolithographic step for patterning said photosensitive resin layer to form a pattern on a substrate;

wherein the photolithographic step includes process steps of exposure and development; and the reaction for making the layer of photosensitive resin composition positive in the photolithographic step is derived from at least the main chain decomposition reaction of the acrylic resin.

The subject-matter of claim 8 differs from this known method in that:

(i) the photosensitive resin composition further comprises a photoacid generator, and

(ii) the first lithographic step is followed by a second photolithographic step for further patterning said photosensitive resin layer in order to form a second pattern on which the first pattern is maintained.

The problem to be solved by the present invention may be regarded as providing a method of forming pattern having level difference with high accuracy and efficiency (see page 9, lines 20-27, of the present description).

Although the above mentioned additional feature (i) is known from D1, said photosensitive resin composition is used to solve another problem, namely the provision of a photosensitive composition with improved stripability in order to manufacture printed wiring boards (see page 3, paragraph 3). Moreover, D1 is silent about additional feature (ii).

The person skilled in the art intending to solve the above-mentioned problem would not have arrived at the subject-matter of present claim 8 when starting from the combined teachings of D3 and D1. Therefore, the subject-matter of present claim 8 (and dependent claims 9-12) can be considered as involving an inventive step (Art.33(3) PCT).

(2b) Claims 15-19:

The same reasoning applies, *mutatis mutandis*, to claims 15-19 describing a method of producing an ink jet head based comprising the method of claim 8.

(2c) Claims 13, 14, and 20:

The document D3 discloses a method of producing an ink jet head (the references in parentheses applying to Figures 1A-1E of D3) including: a discharge port for discharging ink (6); an ink flow path which is in communication with the discharge port and has therein a pressure generating element for discharging the ink (2); a substrate (1) on which the pressure generating element is formed; and an ink flow path forming member which is joined to the substrate to form the ink flow path (3), the method comprising the steps of:

- 1) arranging a layer of a positive type photosensitive resin composition comprising an acrylic resin having a carboxylic anhydride structure, on the substrate on which the pressure generating element is formed;
- 2) irradiating a predetermined site of the layer of the photosensitive resin composition with ionization radiation;
- 3) removing the site irradiated with the ionization radiation through development to form a desired ink flow path pattern;
- 4) forming, on the ink flow path pattern, a coating resin layer for forming an ink flow path wall;
- 5) forming, in the coating resin layer placed on the pressure generating element formed on the substrate, an ink discharge port; and
- 6) dissolving and removing the ink flow path pattern (see claims 24, 41, 42, 44, and 48).

The subject-matter of claim 13 differs from this known method in that said positive type photosensitive resin composition further comprises a photoacid generator.

The problem to be solved by the present invention may be regarded as providing a method of producing an ink jet head with high accuracy and efficiency (see page 9, lines 20-27, of the present description).

Although the above mentioned additional feature is known from D1, said photosensitive resin composition is used to solve another problem, namely the provision of a photosensitive composition with improved stripability in order to manufacture printed wiring

boards (see page 3, paragraph 3). Consequently, the person skilled in the art intending to solve the above-mentioned problem would not have arrived at the subject-matter of present claim 14 when starting from the combined teachings of D3 and D1. Therefore, the subject-matter of present claim 13 can be considered as involving an inventive step.

The same reasoning applies, mutatis mutandis, to claim 14 describing a method of producing an ink jet head derived from the method of claim 13.

The ink jet head produced by the more accurate method of claim 13 can also be considered as novel and inventive.

#### Re Item VIII

#### **Certain observations on the international application**

In present claims 8 and 15 the following sentences are not clear:

"...removing a part except a part serving as a first pattern of the layer of the photosensitive resin composition..." and

"...removing a part on the substrate except a part serving as..."

Nevertheless, said sentences have been clarified in the light of pages 46 and 47 of the present description. Present claim 8 has been interpreted as follows:

A method of forming a pattern having level difference on a substrate by means of a positive type photosensitive resin, comprising;

(1) a step of forming a layer of the photosensitive resin composition according to claim 1 on the substrate;

(2) a first photolithographic step for **patterning said photosensitive resin layer in the thickness direction up to a predetermined depth** to form a first pattern composed of a part protruding from said predetermined depth; and

(3) a second photolithographic step for **further patterning said photosensitive resin layer in order to form a second pattern on which the first pattern is maintained, which forms an overall pattern having level difference**, characterized in that:

- the first lithography step includes process steps of exposure, heating after exposure, and

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development;

- the reaction for making the layer of photosensitive resin composition positive in the first photolithographic step is derived from at least the hydrolytic reaction of a carboxylic anhydride in the acrylic resin;
- the second photolithographic step includes process steps of exposure and development; and
- the reaction for making the layer of photosensitive resin composition positive in the second photolithographic step is derived from at least the main chain decomposition reaction of the acrylic resin.

The same remark applies to present claim 15.